So in part two, we're going to turn to
a brief introduction of inflammation. Now, later on, we will have a whole
lecture on inflammation, and we'll look at all of the various
triggers and controls and what have you. But I wanted to get started with this,
because from what I can see, people have a sort of day to day
understanding of what inflammation is, and they have a very negative view of it.
The word inflammation comes from the word
flame, which means to flame up or to heat. And indeed, an inflammatory
response frequently involves heating of an injured site or
heating of the whole body, okay? I'm sure you've had a fever before, it's
sort of like, gee, and you're very hot. And your first, the first thing that
you tend to do is to want to go take some Advil or
some Tylenol to bring your fever down. That's not necessarily the best move. It
turns out that
inflammation really involves essentially marshaling
the whole immune system, especially the innate preliminary parts,
to fight a new disease threat. So that if you down
regulate this response, it can literally take you longer to
recover from something than if you do not. And another interesting thing, they
found
that when you essentially, okay, so you take your kid off to the pediatrician
and they get a vaccination shot and they're not feeling too good, so
you pop them full of Tylenol. The vaccination will give you
a better immune response if you do not give your child something that's
an antipyretic or anti fever mechanism. Now, having raised children myself, if
you
have a cranky kid that is keeping you up at night by being fussy and unhappy,
I mean, you know, there's almost nothing I wouldn't do, short of heroin, to keep
the kid, you know, sleeping at night. So I'm not saying if your kid is
totally miserable and unhappy and achy, that you shouldn't give them something
for
that. Because quite frankly, I do think you recover better from
things if you can go to sleep. On the other hand, if you are taking
a vaccination or if your child has a vaccination and the child does not seem
to be particularly uncomfortable, I would not automatically stick tylenol in
them or
anything else that lowers their fever. So here's another one. Got some pictures
of some turtles up here,
because these are reptiles in action. Now, reptiles, if you'll recall,
are what is called cold blooded. That is, they have a body
temperature that is more or less the ambient temperature
they find themselves in. Interestingly enough, if you have
a healthy reptile they will usually prefer to have their body temperature in
the range of your body temperature or a little bit lower. And that makes kind of
sense because
98.6 Fahrenheit 37 centigrade is about where a lot of our enzymes
are designed to kind of work the best. On the other hand,
if you have a reptile that is sick, and you give the reptile a choice of spaces,
one at 98.6 and the other at, say, 104,
the reptile will crawl up to the part that's 104 and
stay there until it starts to feel better. In addition to that,
if you keep the reptile cold and don't let it warm up,
it has a lower survival rate than if you allow it to crawl into
a space that's somewhat warmer. So it seems that this
business of producing a fever is part of a response
that is designed to help you recover from
some sort of infection. Among other things, it's associated with
a response that sort of sequesters iron from your bloodstream, and
that makes it harder for bacteria to grow. But there are other things that
are involved in it as well. So we have this response, a fever, which I'm just
going to tell you
is not necessarily a bad thing. Now, supposing you injure yourself,
you sprain your ankle, probably your ankle is not going to
get infected because it doesn't have a break in there, but

it will definitely get inflamed. So then when you have any kind of injury, internal bleeding, something like that, that will also trigger a local inflammatory response. And that has been recognized since Roman times as involving swelling, turns out the tissues leak, redness, the bloodstream goes in there. So you see, it tends to look red because there's a more blood flow in there. Let's see. And it heats up again, because of the blood, and it hurts, okay? So that the pain also hurts. Now, you know, you might want to say to yourself, what good is that? Why is it helping me to be in pain, for heaven's sake? And the reason for that is that it prevents you from doing something even more stupid and injuring it further. So there's also something called, in Latin, functio laesa, you can't use the injured limb or foot or whatever part. And that is actually a protective device to keep you from perhaps making the situation even worse. So these things have been recognized since roman times. Now, indeed, in some cases, you want to keep down the inflammation. And there are other cases where you have something called chronic inflammation, which does you no good whatsoever, except to make you hurt. So then when we look at the inflammatory response, it's not going to be, shall we see a value-laden response? When we go back and look at this in detail, we're going to see this is what's happening and this is why it happens. And that will give you some sort of insights into whether you want to leave it alone or repress it, or we'll see even in certain cases, promoted. Back around the turn of the 19th century, that is the 1800s to 1900s, there was a treatment for cancer that involved putting in something called a Coley toxin. That is this doctor would give cancer patients ground up bacteria. And the ground up bacteria, we will see, and we'll see why in just a minute, would cause a huge raging fever and inflammatory response in the patients, and sometimes they got better. On the negative side, sometimes they died because an excess inflammatory response can kill you. And they hadn't really figured out exactly what was going on and how to manage the dosage, and so this sort of thing, risky as it was, tended to fall out of favor. And so then I had a doctor talk to me who was practicing medicine for the military, and he said that sometimes if somebody had a raging upregulation of malaria, which involved huge fever and chills and what have you, and they were, say, infected with something like syphilis, that the malaria infection would help fight off the syphilis, at least for that brief period of time. So one of the things that is now being used in cancer therapies are immune therapies. And when those things kick in, you usually have a patient that really feels like they've got a massive case of the flu, because what's happening is you are putting out a directed inflammatory response against those cancer cells. And so let's look at it and see a little bit more about exactly what that means. So in this next part, we're going to look at how you signal this inflammatory response in a kind of very general way. Then we will have a whole lecture on inflammation. And so this is just a reminder that if you have some sort of injury that breaks blood vessels, and here, we have something penetrating the epidermis into the dermis and doing exactly that. When that happens, it sets off a chain of events. And here, we have the signals from this, the damaged signals will begin to recruit. And here, you can see the neutrophils. And what the neutrophils are going to do is pack up and leave the circulatory system in response to cytokines that are produced as a result of the injury, possibly as a result of bacteria introduced to the injury. And we're going to go and basically set the immune system on it. And again, those nutrient are the first responders. What leads them to leave the blood vessels and enter into the tissues to essentially do

battle is that there will be changes on the surface of this cell that involve changes in the carbohydrates. And in other cell adhesion molecules that will cause them to first adhere and then leave the wall of the capillaries. So the white cells and other things, other sensors in the damaged tissues will release chemokines. And that's a type of cytokine or regulatory chemical, and it will attract cells to the site of infection. And what's going to essentially happen is that you're going to change the stickiness of this cell to the endothelial lining of the blood vessel. And so what's going to happen is as that cell gets stickier, it's going to kind of bind and release, bind and released. And that's going to essentially upregulate the stickiness in this cell, causing it to stick more tightly. And then that part, it will be activation. And when it sticks more tightly, it's going to arrest. And after it arrests, it's going to look for a way to poke its way between two of the cells in the lining and migrate out. So here we have some lists at the bottom of different kinds of chemical changes that take place during this. But again, this is just a little bit of a preliminary look. We're going to spend a whole lecture on this. And again, a reminder that the macrophages will also be involved in this extravasation response. They may pick up foreign antigen, travel to the Th cells, the Th cells will then upregulate this whole inflammatory process and coordinate a further adaptive attack.